



| Components   | TPM  | RCM  |
|--|--|--|
| Focus on important machines                            | no   | Yes  |
| Creation of inspection methods for the equipment       | no   | Yes  |
| Individual determination of the maintenance strategy   | no   | yes  |
| Tips on the use of diagnostic methods                  | yes  | yes  |
| Creation of spare part management                      | no   | only general tips                                |
| Instructions on inclusion of sub-companies             | yes  | No   |
| Tips for constructive modifications                    | yes  | Yes  |
| Instructions for formation of redundancies             | no   | Yes  |
| Tips for the speedy replacement of construction groups | yes  | Yes  |
| Description of maintenance tasks                       | Inspection and servicing (not including repairs) | Inspection and servicing (not including repairs) |
| Tips for increased productivity                        | no   | No   |
| Determination of time needed                           | no   | No   |
| Determination of implementation responsibility         | Yes  | Yes  |
| Determination of implementation intervals              | Yes  | Yes  |
| Employee instruction                                   | Yes  | yes  |
| Further training for employees                         | Yes  | yes  |
| Adaptation of construction organization                | No   | No   |

FIG. 1  
(PRIOR ART)

FIG. 2

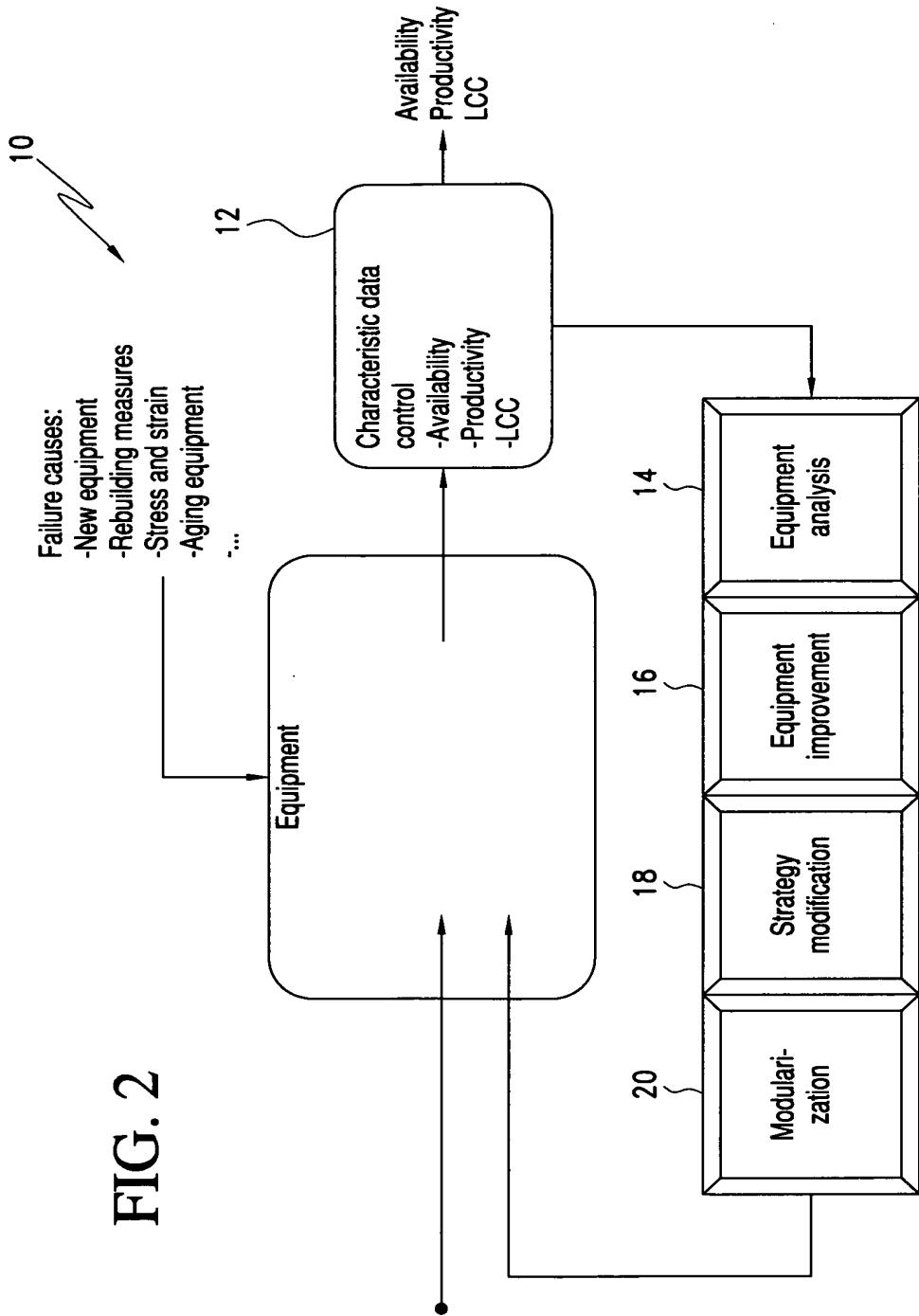


FIG. 3

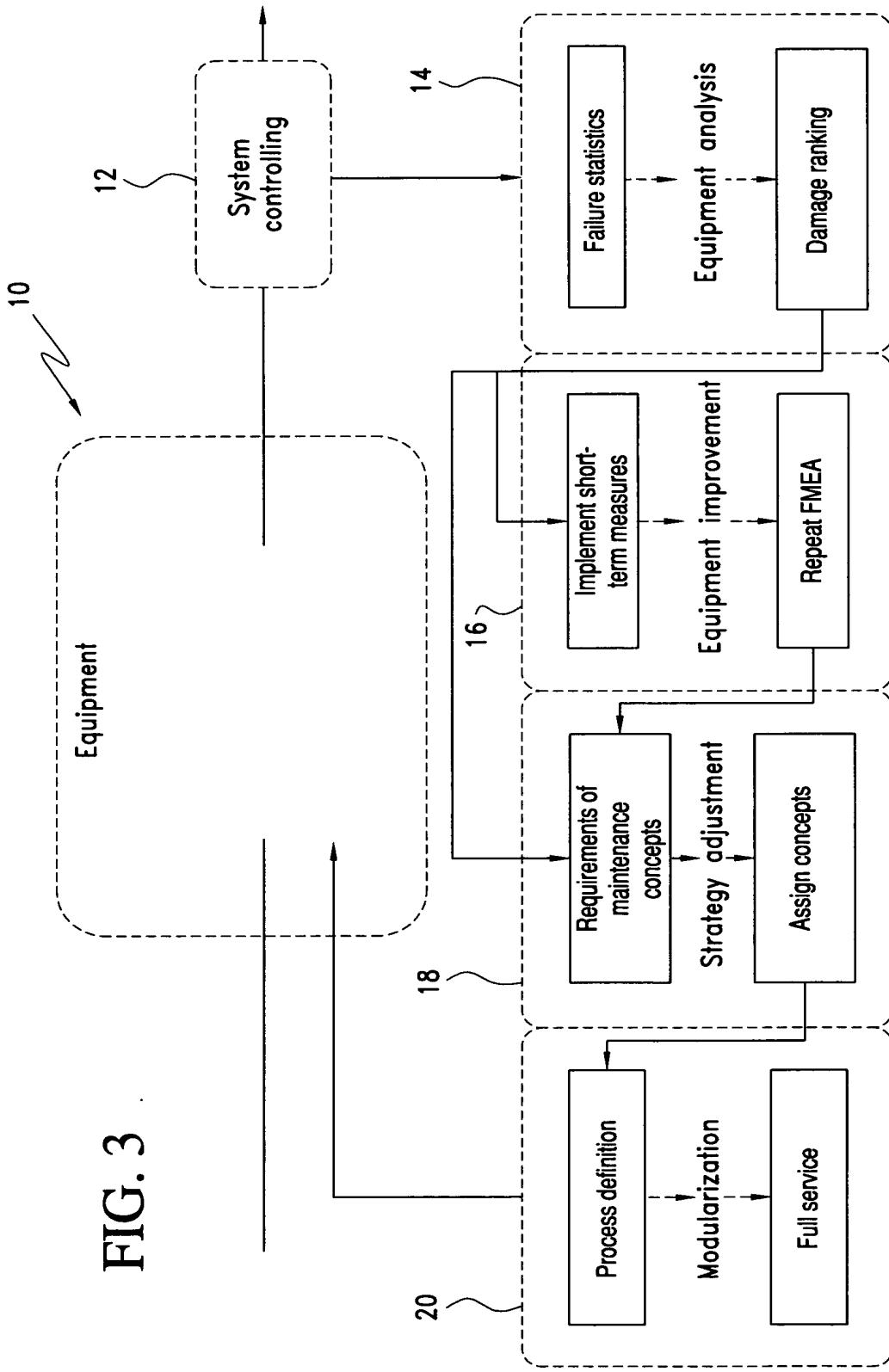
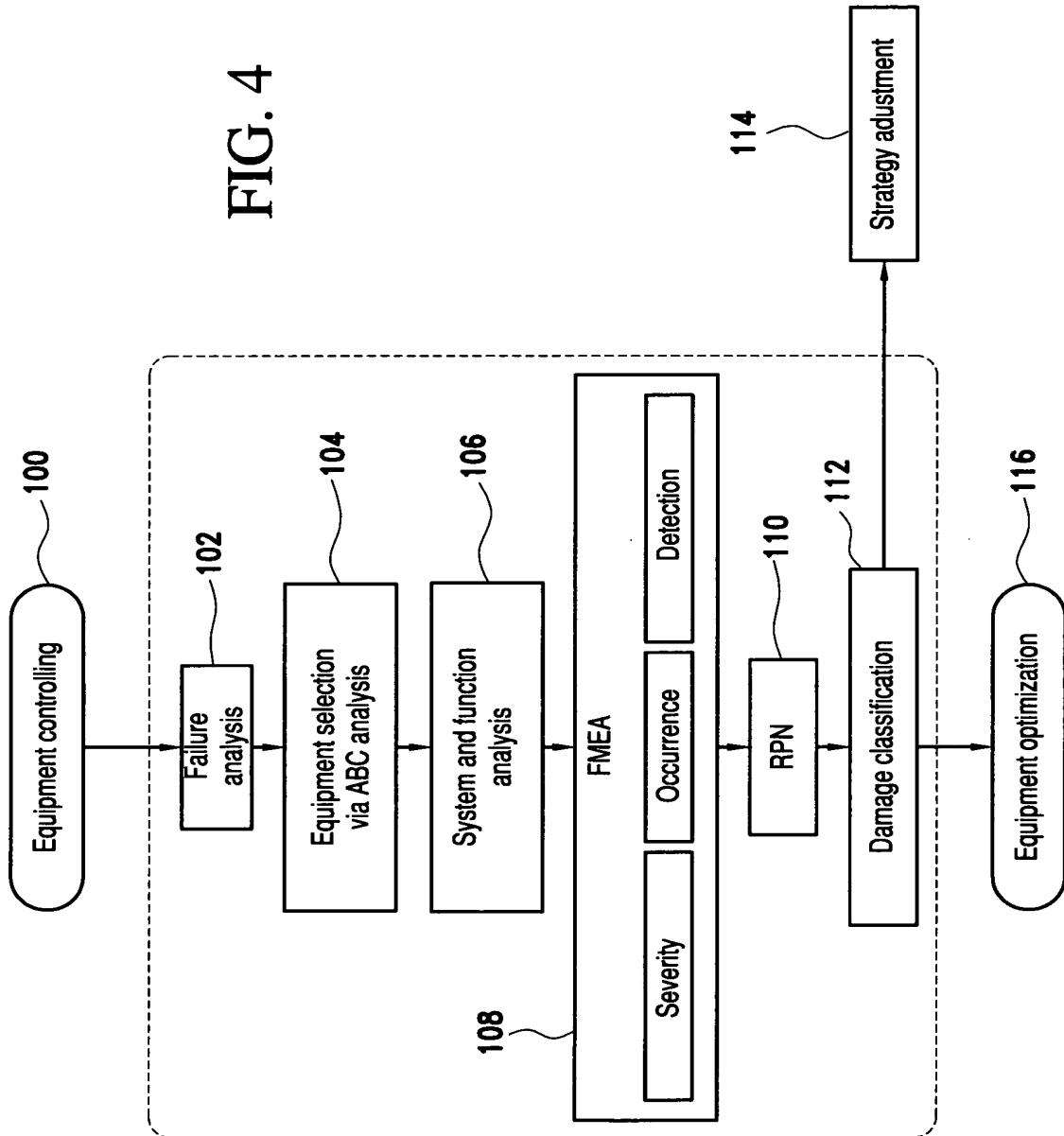


FIG. 4



5/24

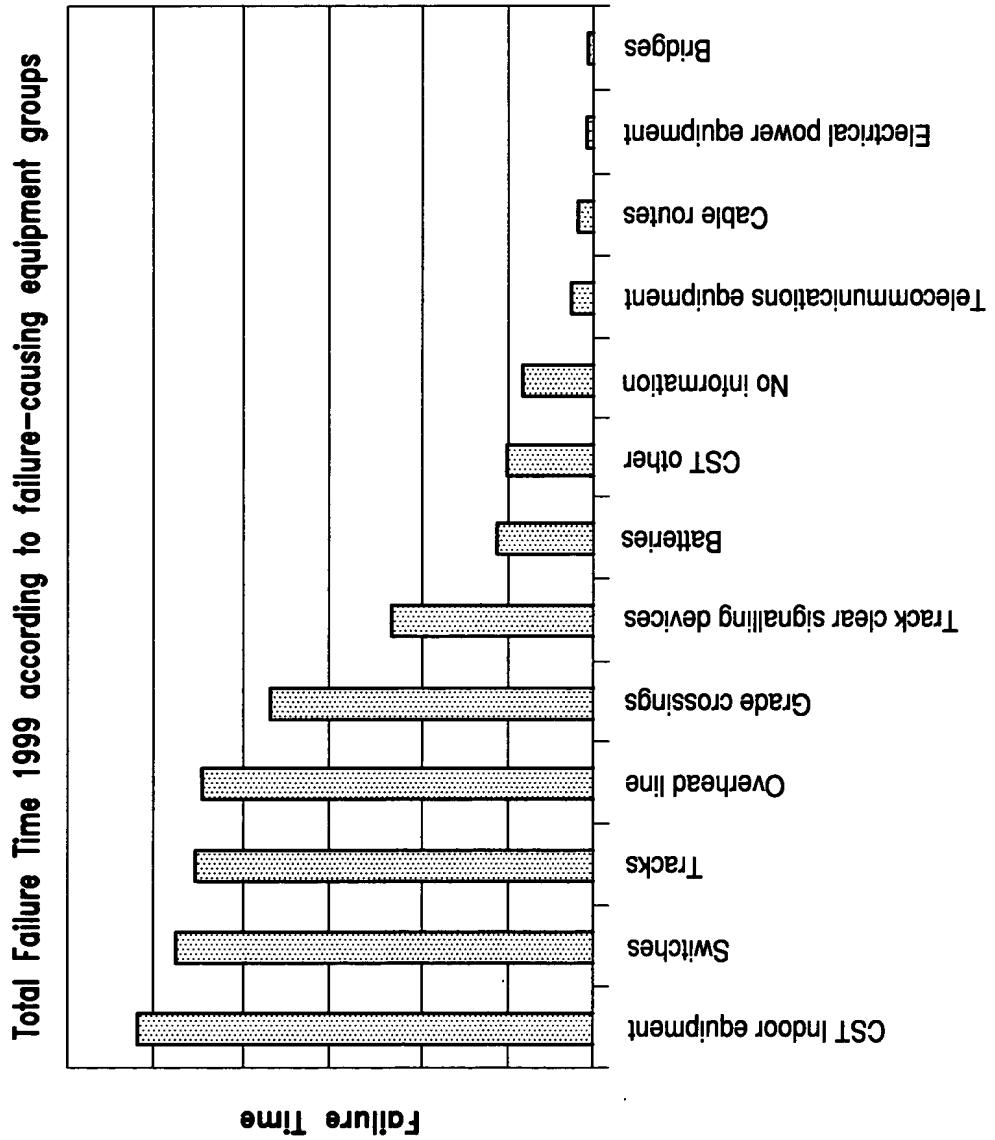


FIG. 5

6/24

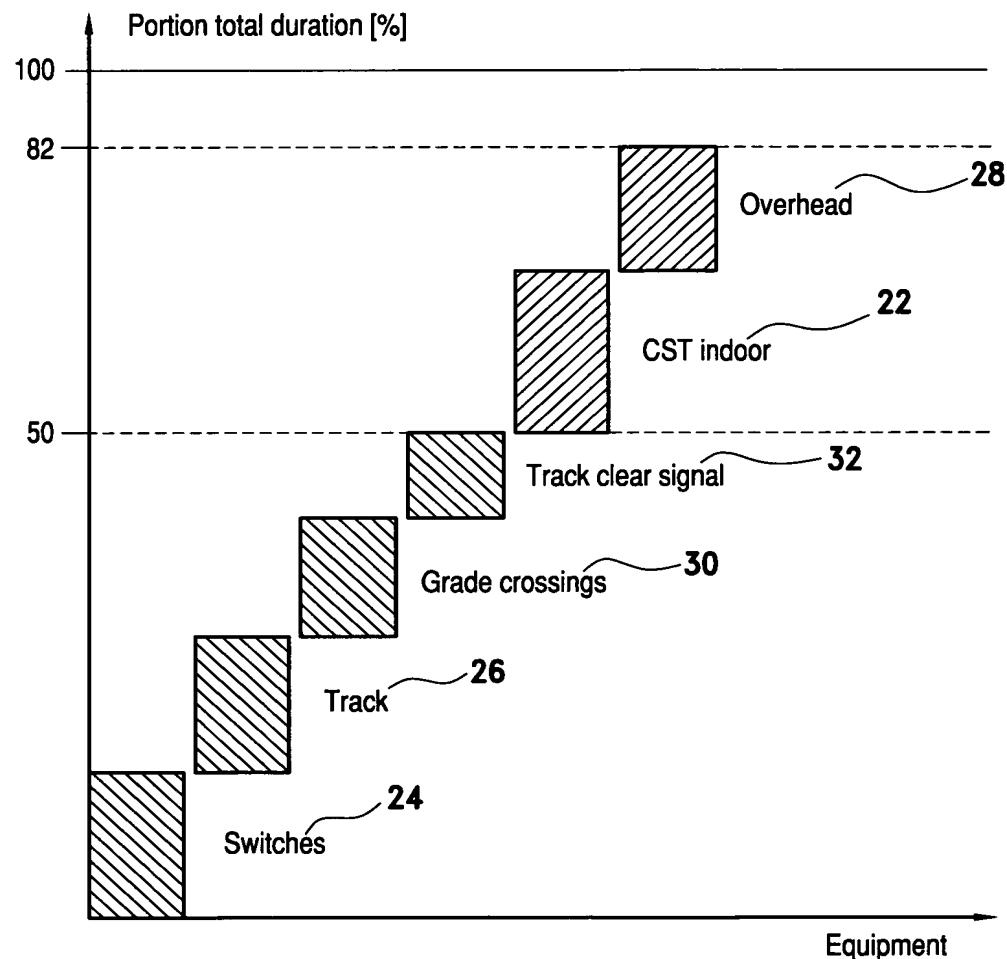
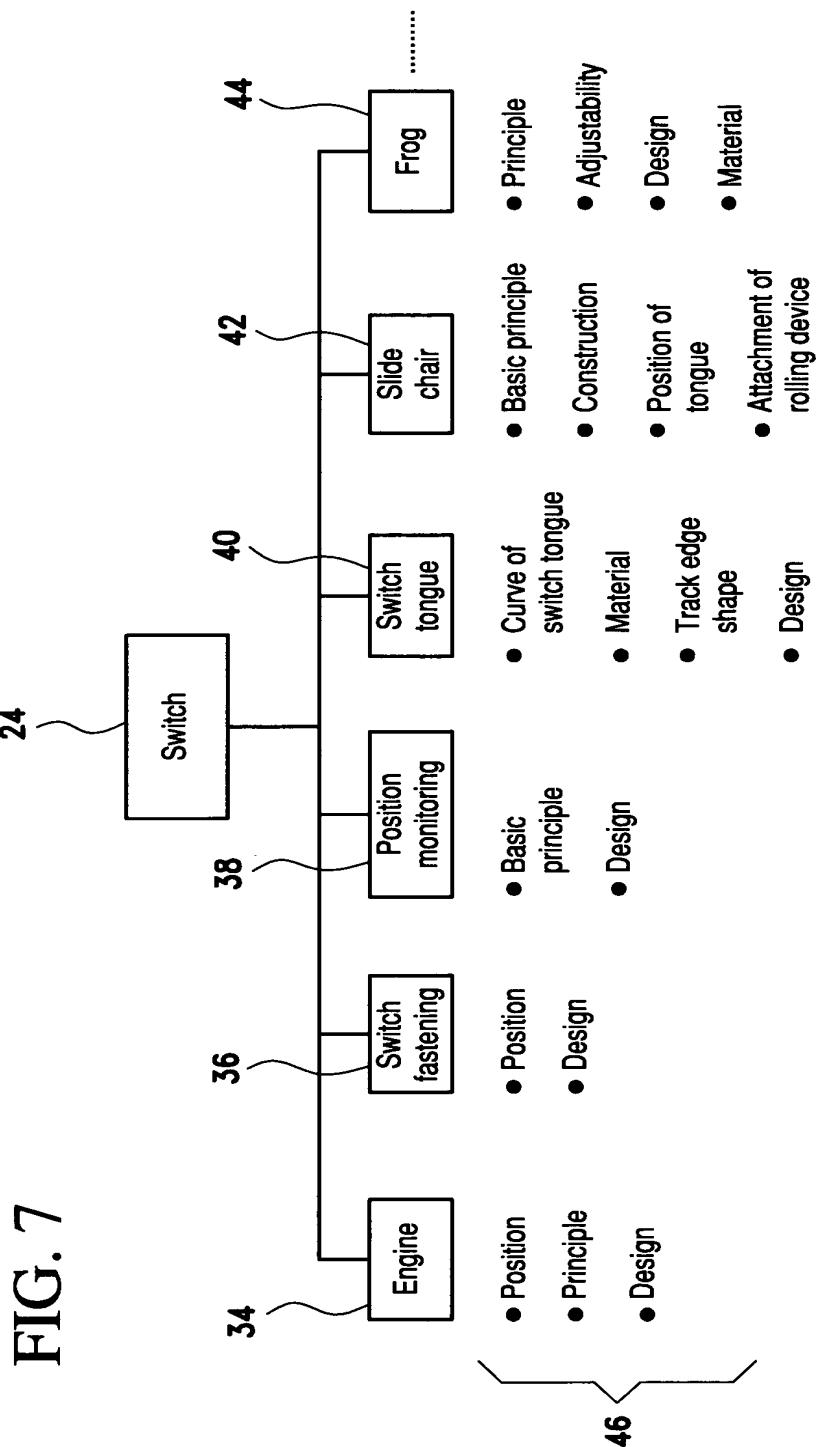


FIG. 6

7/24



8/24

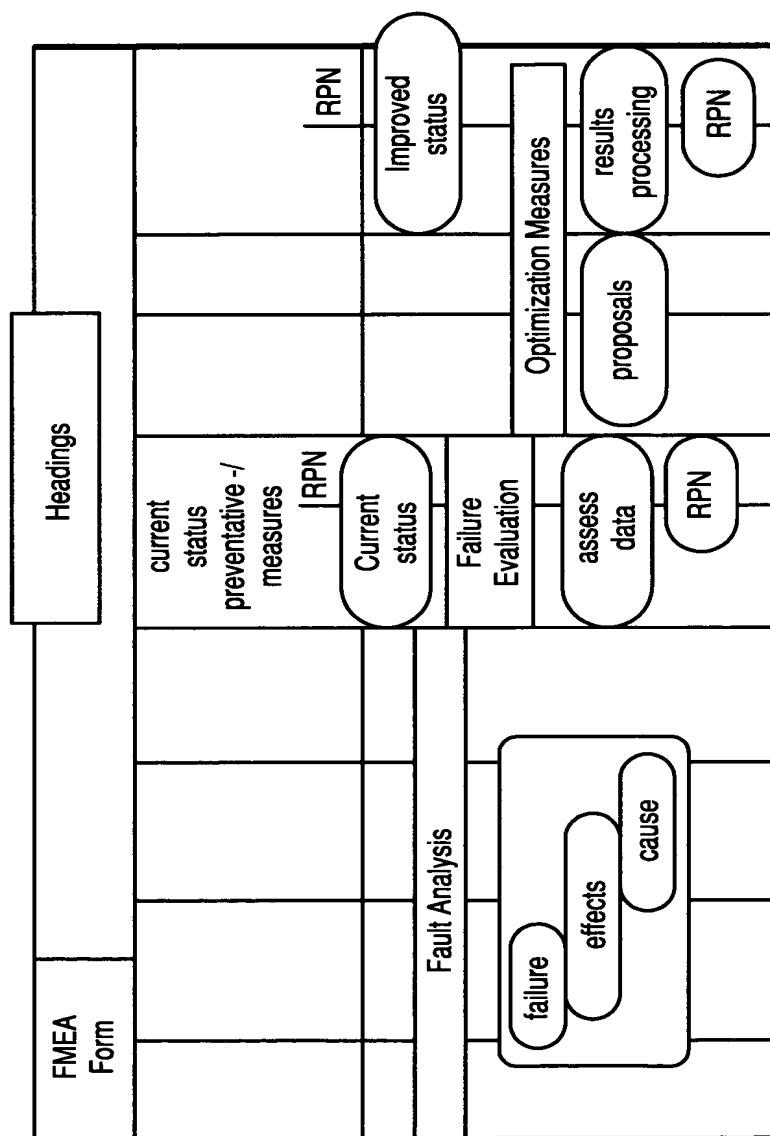
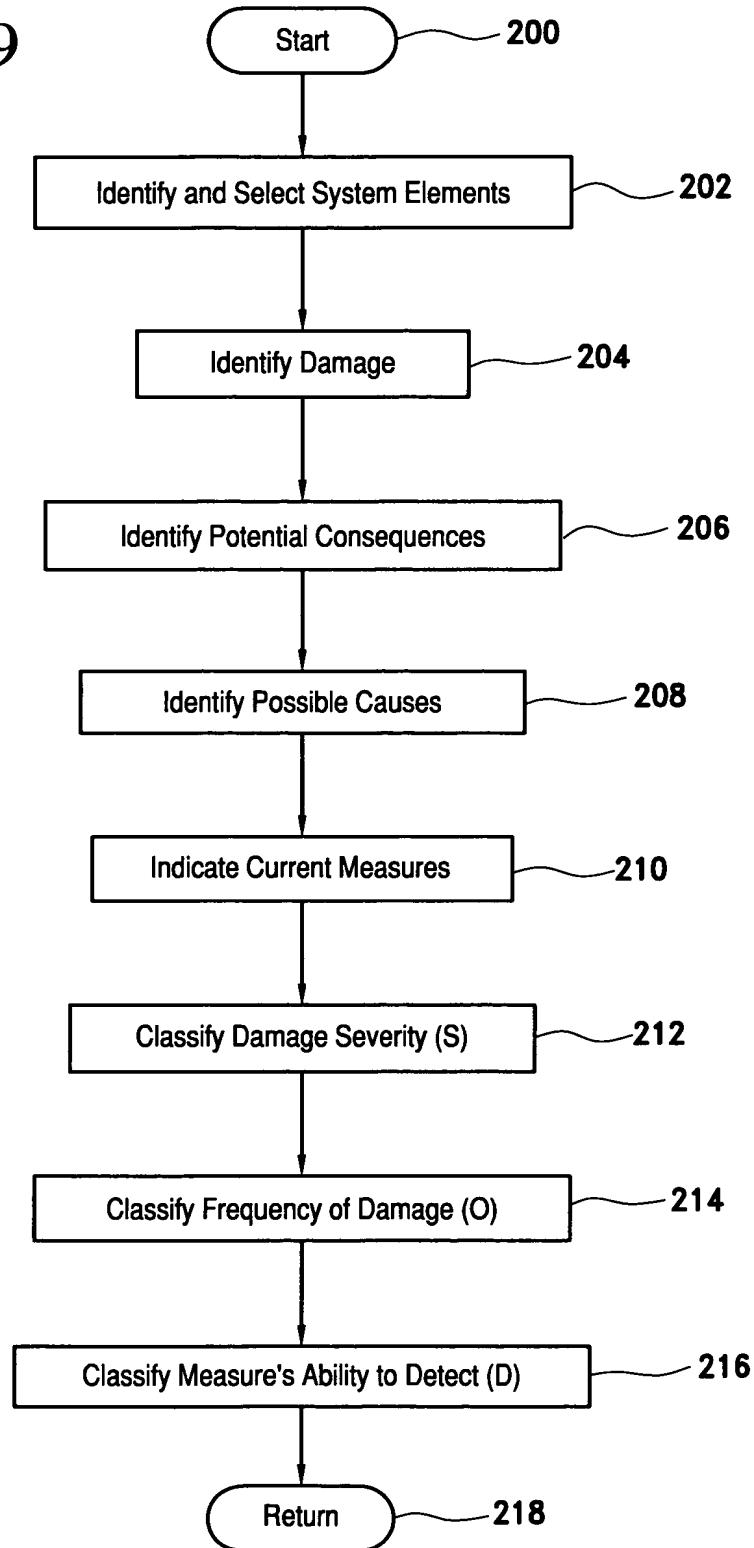


FIG. 8

9/24

FIG. 9



10/24

| Current Damage Cause Evaluation and Classification |     |  |                                |                                      |  |
|--|-----|--|--------------------------------|--------------------------------------|--|
| Damage Description                                 | No. | Potential Results  | Potential Causes (wear & tear) | 0                                    | Preventative and Inspection Measures                             |
| Passage groove too small                           | 1   | Collision alarm through approaching of switch tongue         | 4                              | Bent switch tongue                   | Measurement of passage groove                                    |
|  | 2   | Broken switch tongue due to running up against switch tongue | 9                              | Assembly defect in control mechanism | Acceptance inspection for maintenance work by external companies |
|  | 3   | Wheels strike the switch tongue (overriding of the rail)     | 6                              |                                      |  |

FIG. 10

11/24

| Current Damage Cause Evaluation and Classification |               |  |  |  |     |
|--|---------------|--|--|--|-----|
| Damage Description                                 | Potential No. | Potential Results  | Potential Causes (wear & tear)         | Preventative and Inspection Measures           | RPN |
| Passage groove too small                           | 1             | Collision alarm through approaching of the switch tongue         | 4 Bent switch tongue                   | Measurement of passage groove                  | 360 |
|  | 2             | Broken switch tongue due to running up against the switch tongue | 9 Assembly defect in control mechanism | Acceptance of the repair by an outside company | 210 |
|  | 3             | Wheels strike the switch tongue (overriding of rail)             | 10                                     |  |     |

FIG. 11

12/24

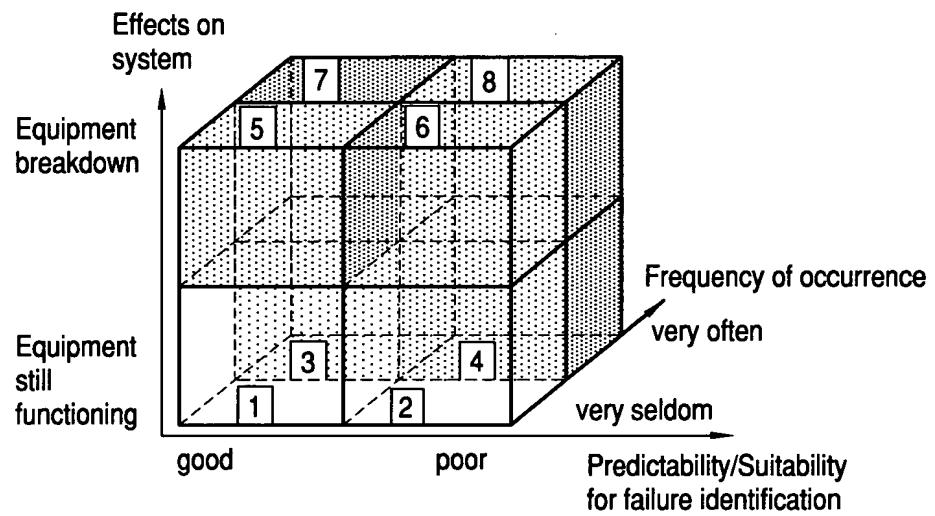


FIG. 12

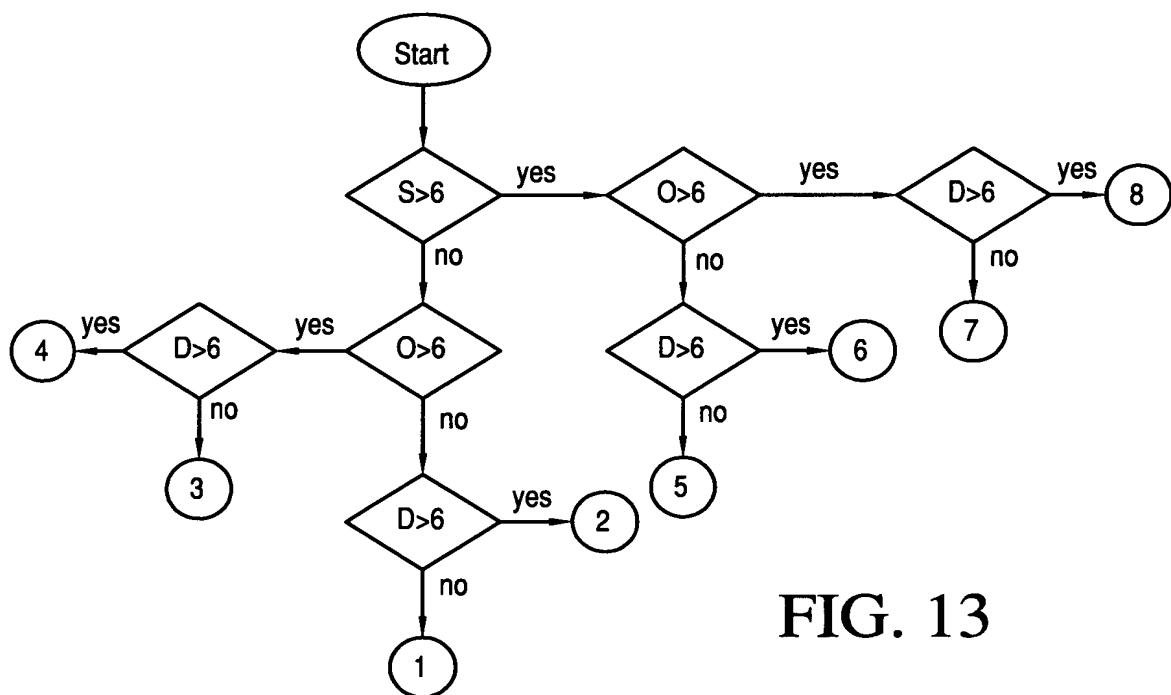


FIG. 13

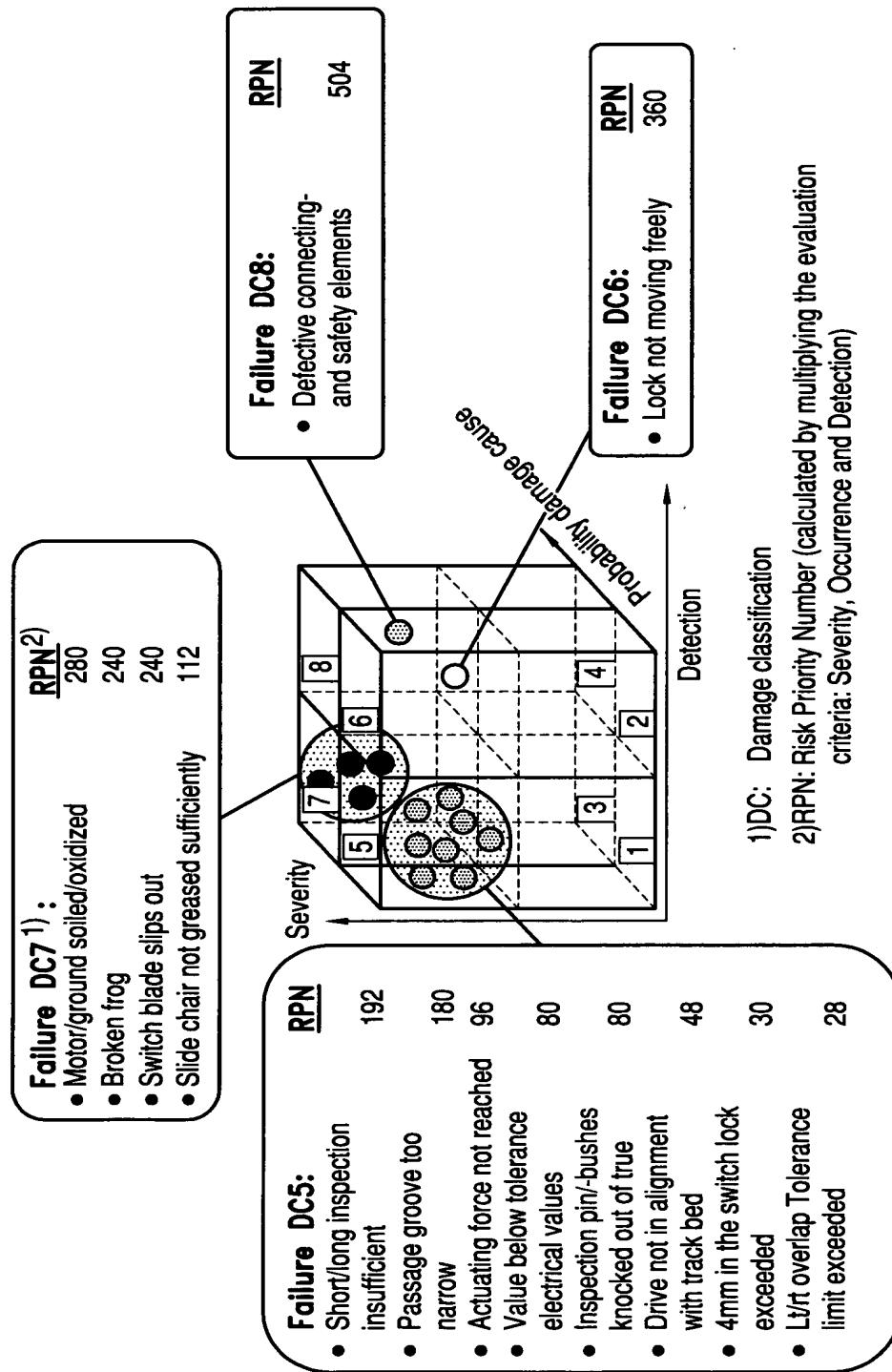
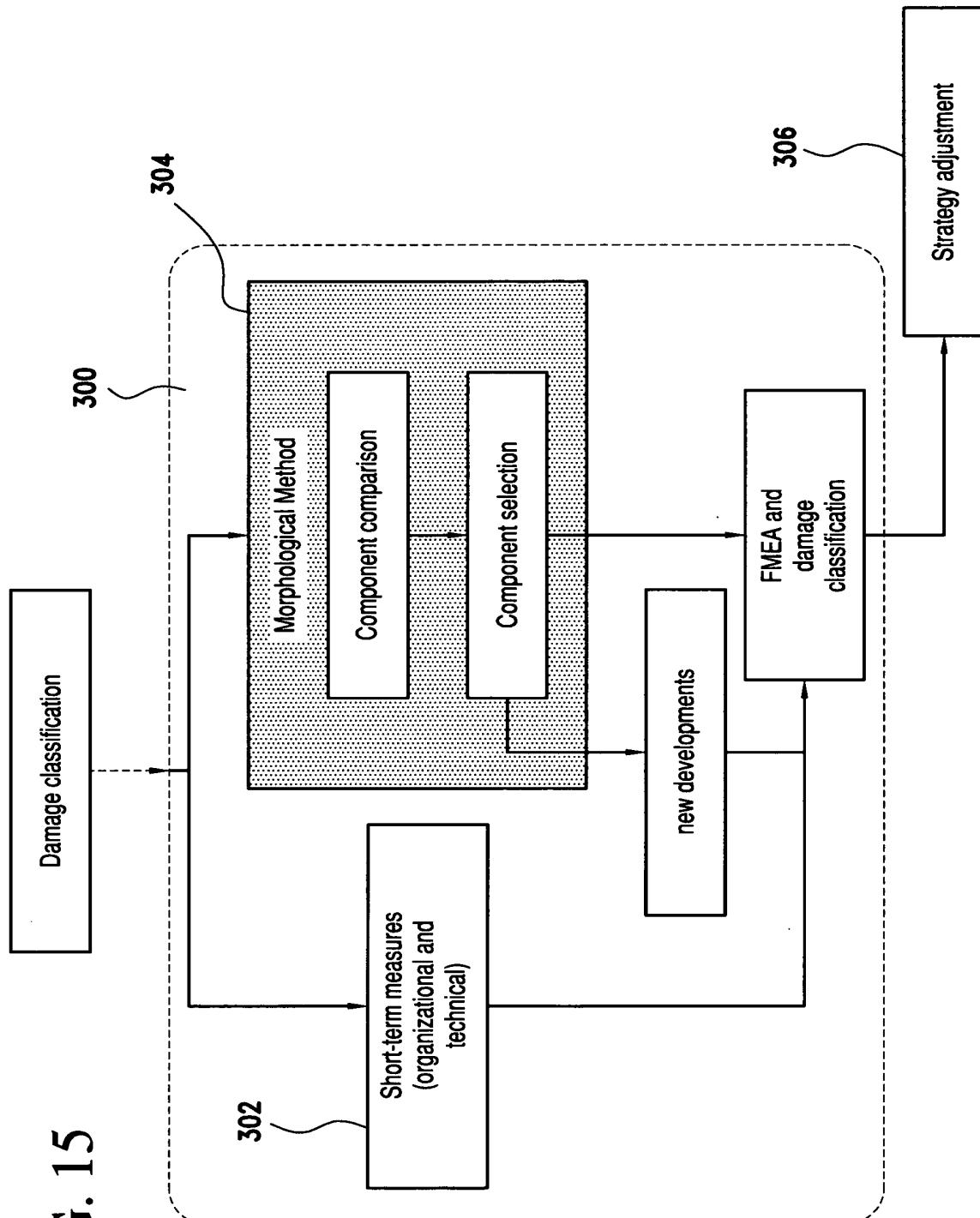


FIG. 14



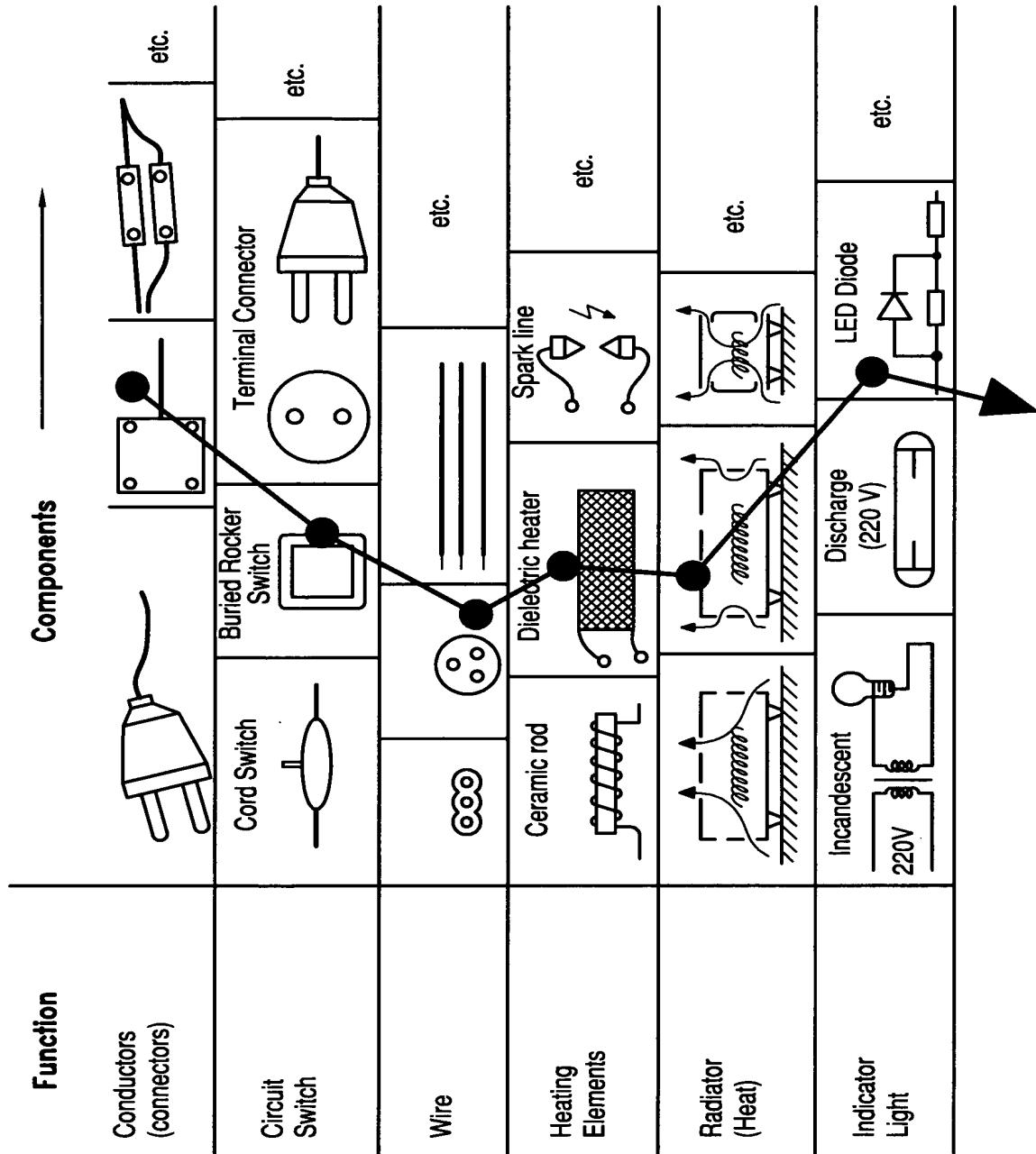
15/24

| No. | Equip-<br>ment | Problem   | Measure<br>Proposal from<br>FMEA Workshop   | In charge   | Date    | Comments                                     |
|-----|----------------|---|---|-------------|---------|--|
| 1.1 | Switch         | Stiffness of switch in interlock or due to inadequately lubricated slide chairs | Equipping of the switches with latch fastenings and roller slide chairs in critical systems | Mr. Schmitz | 06/2001 | Budget of DM 50,000 authorized by management |
| 1.2 | Switch         | Defective connecting and locking elements                                       | Use self-locking transmission and connecting elements                                       | Mr. Schultz | 12/2001 | Only No. 237 screws to be used               |

FIG. 16

16/24

FIG. 17



17/24

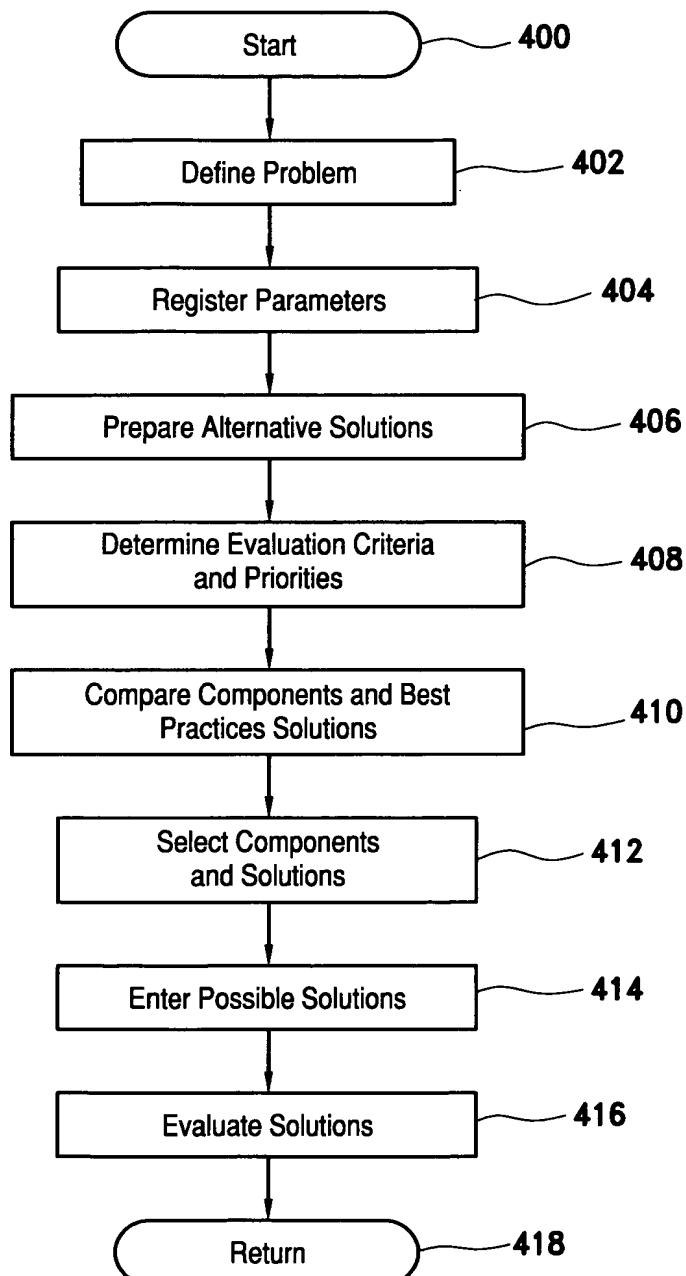


FIG. 18

18/24

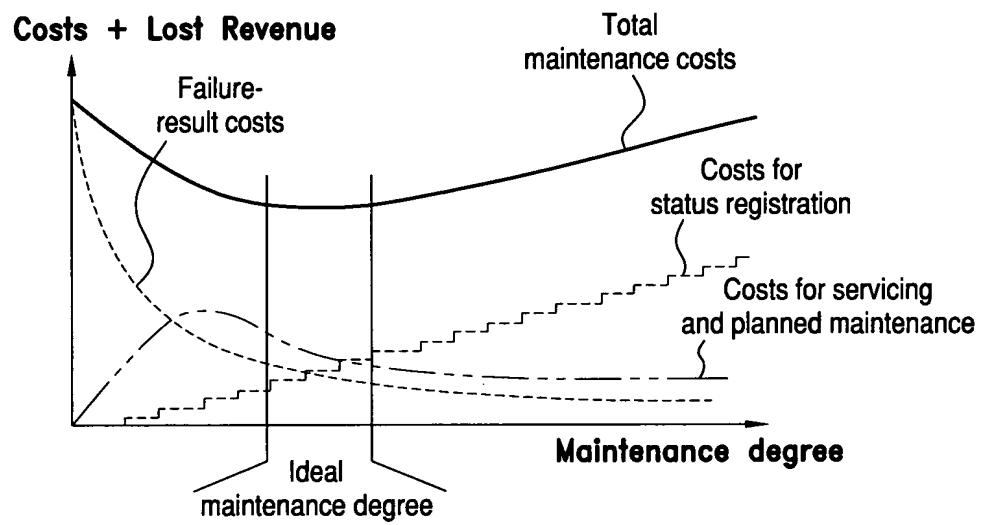


FIG. 19

19/24

|                         |                           |   |   |
|-------------------------|---------------------------|---|---|
| Basic conceptions       | Track shape               | R 65  | UIC 80  |
|                         | Travel surf, inclinat.    | Rails with asymmetrical head with incl. 1:40      | Normal rails with 1:40 inclination                        |
|                         | Geometrical shape         | Circular arc switch                               | Clothoid switch   |
|                         | Pos.                      | Interior drive (integrated into tie)              | Drive on outside (integrated into tie)                    |
|                         | Basic princ.              | Electrical  | Locally set mechanically                                  |
|                         | Str. shape                | Electromech. with toothed rack                    | Electro/hydraulic power transmission                      |
|                         | Design                    | Modular design                                    | Variably adjustable                                       |
|                         | Actuating force Transmis. | Single drive                                      | Central drive with hydraulic power transmiss. (Hydrolink) |
|                         | Pos.                      | Fastening on inside                               | Fastening on outside in fastening tie                     |
|                         | Str. shape                | Low-maintenance fastening (WKV) (latch fastening) | Sliding clamp fastening                                   |
| Locking                 | Basic princ.              | Interlocking of tongue tester in drive            | Tongue connector rod electrically monitored               |
|                         | Basic princ.              | Electromech. tongue stat. discrep. monitor        | Limit switch (French/Czech system)                        |
|                         | Peak fastening version    | Status tester in drive                            |   |
|                         | Medium fastening version  | Tongue tester R=500                               |   |
| Stat. discrep. monitor. | Str.                      | Without temp. balancing poss.                     | New tester rod  |
|                         | Basic princ.              | Axlecounter                                       | 100 hz bond wire  |
| Clear signal            |                           |   | (●)   |

FIG. 20

20/24

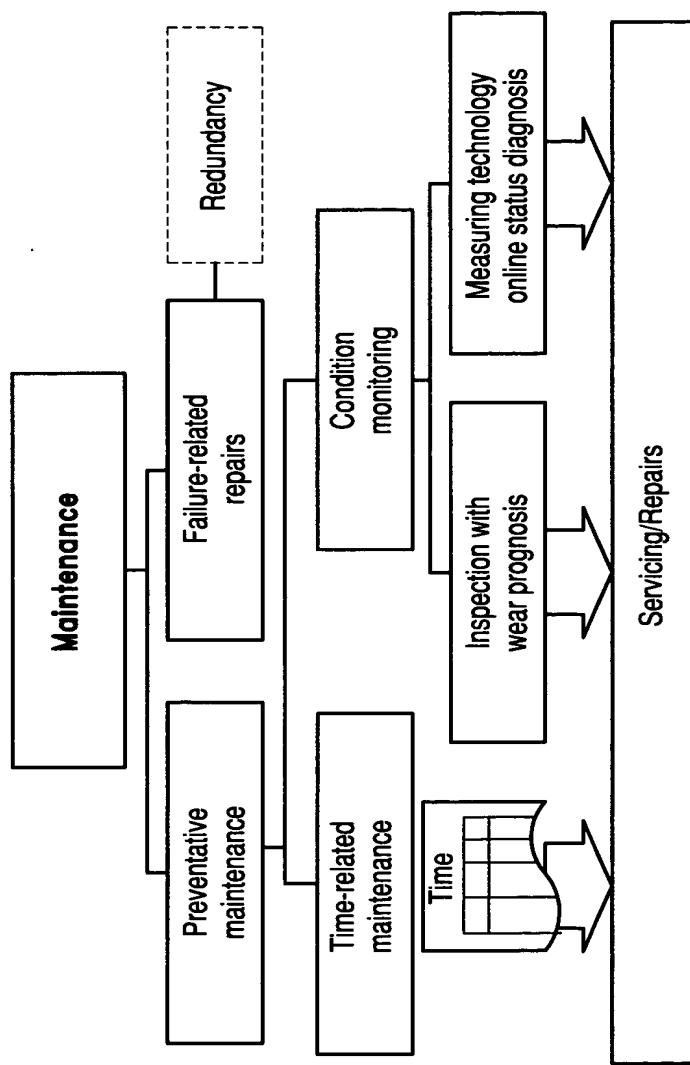
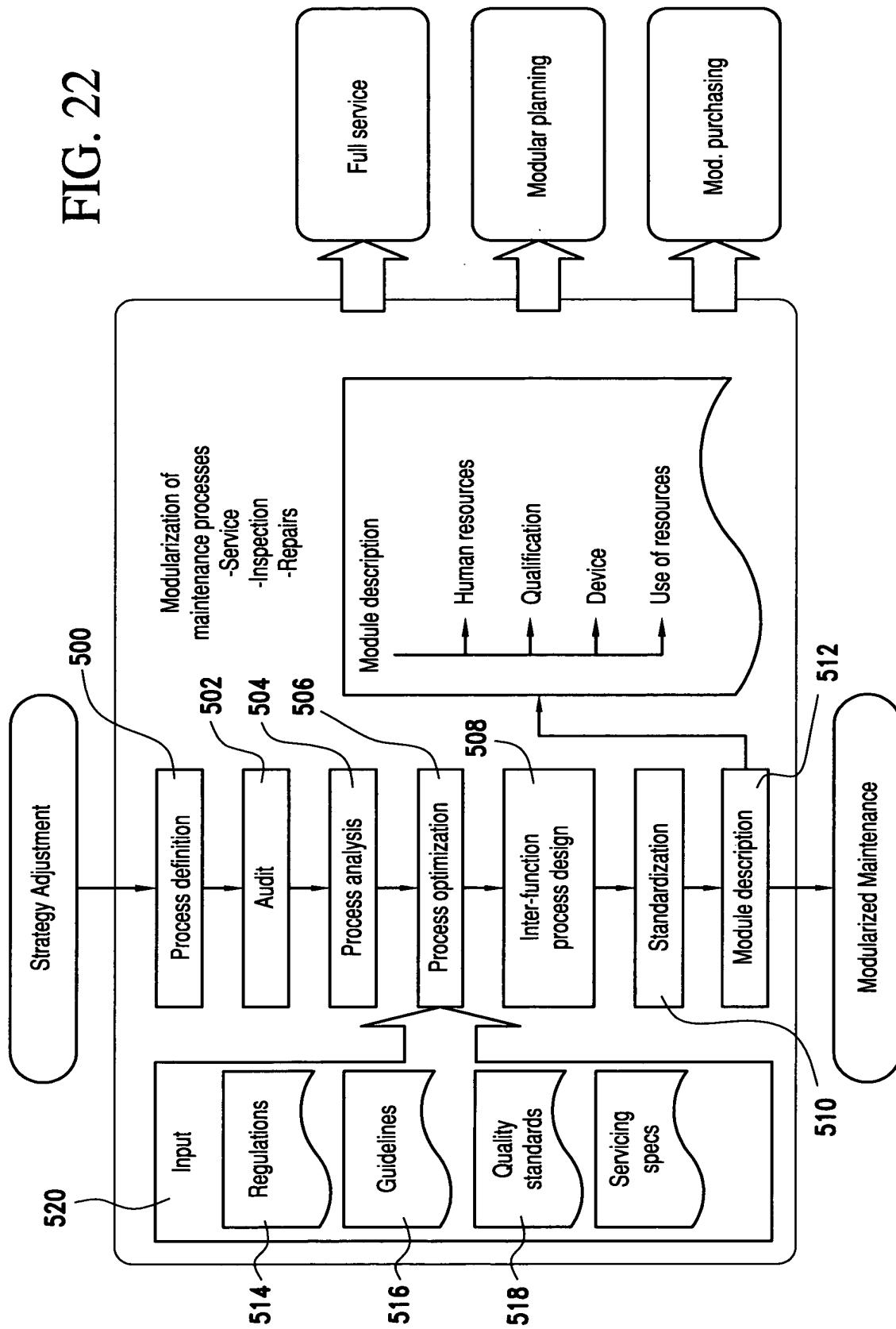


FIG. 21

21/24

FIG. 22



REPLACEMENT SHEET  
Application No. 09/997,248

22/24

FIG. 23

23/24

| Switches                 |  |   |                                       |                                   |   |                                |                    |                  |                    |
|--------------------------|--|---|---------------------------------------|-----------------------------------|---|--------------------------------|--------------------|------------------|--------------------|
| Module number            | Module                                       | Module contents   | Machines devices additional personnel | Module time/ unit (Format minute) | Number of employees/ qualifications   | Time limits acc. to load codes |                    |                  | Bill of quantities |
|                          |  |   |                                       |                                   |   | CST 91 Tw 1 low                | CST 92 Tw 1 normal | CST 93 Tw 3 high | CST 93 Tw 4 high   |
| INWE 300.1.93.4          | Switch 190 to 300 electr. (Time limit 1)[SI] | Single switch with electric drive radius 190 to 300 m maintenance, inspection, functional check and general details acc. to DS 892.03 Appendix 02 Appendix 03                     |                                       | 11 Mai                            | 1 Wmech (Cert. acc. to 821.2005)<br>1 Wmech   |                                |                    | 1                | 1                  |
| INWE 300.2.92.1.2.93.3.4 | Switch 190 to 300 electr. (Time limit 2)[SI] | Single switch with electric drive radius 190 to 300 m maintenance, inspection, functional check and general details acc. to DS 892.03 Appendix 02 Appendix 03                     |                                       |                                   | 1 Wmech (Cert. acc. to 821.2005)<br>1 Wmech   |                                | 2                  | 2                | 2                  |
| INWE 300.3.93.3.4+A1     | Switch 190 to 300 electr. (Time limit 3)[SI] | Single switch with electric drive radius 190 to 300 m maintenance, inspection, functional check and general details acc. to DS 892.03 Appendix 02 Appendix 03 Tw acc. to 821.2005 |                                       |                                   | 1 M Tw od. 1 MA with proven 2-year testing work of measuring instrument (821.2005)<br>1 Wmech (Cert. acc. to 821.2005)<br>1 Wmech | 51.5                           |                    | 3                | 3                  |

FIG. 24

24/24

| Components   | TPM                                      | TPM                                      | Modular-<br>ization                      |
|--|--|--|--|
| Focus on machines                                      | No                                       | Yes                                      | Yes                                      |
| Creation of inspection methods for the equipment       | No                                       | Yes                                      | Yes                                      |
| Individual determination of the maintenance strategy   | No                                       | Yes                                      | Yes                                      |
| Tips on the use of diagnostic methods                  | Yes                                      | Yes                                      | Yes                                      |
| Creation of spare part management                      | No                                       | General tips                             | Yes                                      |
| Instructions on inclusion of sub-contractors           | Yes                                      | No                                       | Yes                                      |
| Tips for constructive modification                     | Yes                                      | Yes                                      | Yes                                      |
| Instructions for redundancy formation                  | No                                       | Yes                                      | Yes                                      |
| Tips for the speedy replacement of construction groups | Yes                                      | Yes                                      | Yes                                      |
| Description of maintenance tasks                       | Inspection + service (not incl. repairs) | Inspection + service (not incl. repairs) | Inspection + service (not incl. repairs) |
| Tips for increased productivity                        | No                                       | No                                       | Yes                                      |
| Determination of required time                         | No                                       | No                                       | Yes                                      |
| Determination of implementation responsibility         | Yes                                      | Yes                                      | Yes                                      |
| Determination of implementation intervals              | Yes                                      | Yes                                      | Yes                                      |
| Employee instruction                                   | Yes                                      | Yes                                      | Yes                                      |
| Further training of employees                          | Yes                                      | Yes                                      | Yes                                      |
| Adaptation of construction organization                | No                                       | No                                       | yes                                      |

FIG. 25